Reproductive health concerns: jeopardised age groups

Ph.D. Thesis

Zoltán Kozinszky M.D.

2004

University of Szeged
Albert Szent-Györgyi Medical and Pharmaceutical Centre
Faculty of Medicine
Department of Obstetrics and Gynaecology

List of scientific publications related to the subject of this thesis

I. **Z. Kozinszky,** Gy. Bártfai: Contraceptive behaviour of teenagers requesting abortion. Eur J Obstet Gynec Reprod Biol, 112: 80-3; 2004.

II. **Z. Kozinszky,** K. Boda, Gy. Bártfai: Determinants of abortion among women undergoing artificial termination of pregnancy. Eur J Contracept Reprod Health Care, 6: 145-152; 2001. (IF=0.884)

III. **Z. Kozinszky,** Gy. Bártfai: Terhességmegszakítást kérő tizenévesek fogamzásgátlási szokásai. Magyar Nőorvosok Lapja, 65: 183-187; 2002.

IV. **Z. Kozinszky,** H. Orvos, M. Katona, T. Zoboki, A. Pál, L. Kovács: Perinatal outcome of induced and spontaneous pregnancies of primiparous women aged 35 or over. Int J Gynec Obstet, 76: 23-26; 2002. (IF=0.635)

V. **Z. Kozinszky,** H. Orvos, T. Zoboki, M Katona, K Wayda, A Pál, L Kovács: Risk factors for cesarean section of primiparous women over 35. Acta Obstet Gynaecol Scand, 81: 313-316; 2002. (IF=1.209)

VI. **Z.** Kozinszky, H. Orvos, J. Zádori, T. Zoboki, M. Katona, A. Pál, L. Kovács: 35 éven felüli először szülő nők ttterhessége és újszülöttjeinek neonatológiai jellemzői. Magyar Nőorvosok Lapja, 65: 249-254; 2002.

Citable abstracts:

I. **Z. Kozinszky,** Gy. Bártfai. Questionnaire survey among women requesting abortion. International Journal of Gynecology and Obstetrics Suppl. 70, 1:115; 2000.

II. Gy. Bártfai, **Z. Kozinszky.** Which factors influence the use and choice of contraceptives among teenagers undergoing induced abortion? International Journal of Gynecology and Obstetrics Suppl. 70, 1:57; 2000.

Book chapters related to the thesis:

I. K. Boda **Z. Kozinszky,** Zs. Balogh. The appliance of multivariate regression models in medicine. In: The appliance of computer studies in medicine and biology (XXII. Neumann Colloqium), pp. 61-64, Veszprém, November 9-10, 2000.

II. **Z. Kozinszky,** K. Boda, Gy. Bártfai. Analysis of the contraceptive habits of women requesting abortion. In: The appliance of computer studies in medicine and biology (XXII. Neumann Colloqium), pp. 65-68, Veszprém, November 9-10, 2000.

III. **Z. Kozinszky,** H. Orvos, T. Zoboki, M. Katona, A. Pál. Perinatal outcome of primiparous women aged 35 or older. In: European Psychosomatic Obstetrics and Gynaecology 2001 (Proceedings of the VIIth European Symposium on Psychosomatic Obstetrics and Gynaecology). Editors: P. Szeverényi, P. Nijs, D. Richter, pp. 169-171, Debrecen, Hungary, 2001.

Abbreviations

WHO: World Health Organisation

EC: emergency contraception

OCs: oral contraceptives

IUD: intrauterine device

UK: United Kingdom

IUGR: intrauterine growth retardation

SPSS: Statistical Package for Social Sciences

OR: odds ratio

CI: confidence interval

kg: kilogram

m: metre

ARTs: assisted reproductive techniques

vs.: versus

Contents

1. Introduction

1.1. Trends in reproductive characteristics

Reproductive health is an issue of universal importance, as it means the ability to achieve intact fertility, delivery and the possibility of correct contraception during reproductive life. The avoidance of miscarriage, ectopic pregnancy and pathologic conception can preserve reproductive health. A WHO report estimates that over 100 million acts of sexual intercourse take place each day [1]. These result in some 910,000 conceptions, of which about 50% are unplanned and about 25% are unwanted. Some 150,000 unwanted pregnancies are terminated by induced abortion every day – or up to 53 million each year. Demographers calculate that between one-third and one-half of all women have had at least one induced abortion before they reach the menopause [2].

In industrialised countries, pregnancy has been shifting towards older ages, which consequently increases the likelihood of the termination of pregnancy before delivery. Moreover, the unwanted pregnancy rate among teenagers has been definitely increasing in recent years [3].

The most critical age groups as concerns reproductive health are: adolescents and older women (women over 40 and primiparous women over 35). Generally, the members of both groups are unaware of their fertility or sometimes have no regular sexual activity [3]. Their endocrine changes during menstrual cycles result in difficulties in fitting contraceptives. In both age groups, emergency contraception (EC) may play a major role if the protection against unwanted pregnancy was not adequate, due to patient failure, the use of less reliable methods (condom, withdrawal, periodic abstinence or no method) or a method failure relating to the use of oral contraceptives (OCs).

In Hungary, as in Western-European countries, child-bearing has been shifting towards older ages during recent decades, due to a career-oriented lifestyle, an increasing rate of infertility and socio-economic reasons [4]. Traditionally, an older pregnancy presents a higher risk concerning the delivery and the neonatal outcome, and congenital chromosomal anomalies are more prevalent [1,5].

Older women want to stop childbearing after the desired number of children, while the harmful effects of miscarriage on reproductive health are minimal at the end of the

reproductive career [3]. These women are aware of their decreased fertility at the end of reproduction.

More and increasingly younger adolescents are sexually active and pay less or no attention to contraception. Those in their early teens are too socially and biologically immature to deliver a newborn [3, 6, 7]. Youngsters are irresponsible and are not well informed about fertility following unprotected intercourse [3]. Among the causes, besides earlier maturity, we may assume inadequate birth control education, financial problems, irregular sexual activity and ineffective contraception, because they do not want to risk the weight gain associated with OC use [3, 7]. Besides earlier sexual and biological maturation (the menarche and sexarche are shifting towards younger ages), the childbearing age of the first delivered child is moving towards older ages. Consequently, the time interval between the first sexual intercourse and the first delivery (in which protection against an unwanted pregnancy is necessary) is increasing [3, 7]. This is a great challenge for the health service in Hungary; the median age at the termination of pregnancy has been decreasing, whereas a lower number of interruptions before the first delivery would be beneficial [8, 9].

The rate of abortion among teenagers in the USA is high (>20%) [10], as compared with about 10% in Western-European countries [3]. Efforts need to be directed by society to decreasing the rate of abortion among teenagers, in order to build a reliable future. Although the rate of usage of reliable contraceptives is hardly less than that in the Western-European countries, the abortion rate in Hungary is high; it is also higher than in the surrounding Eastern-European countries, e.g. Slovakia (1995: 59.67%), the Czech Republic (1993: 58.36%) and Slovenia (1995: 58.4%) [8]. This paradox can obviously be explained by the misuse of OCs as a reliable method and the misuse of less reliable methods.

An abortion is performed almost every second worldwide [11]. Both the number of live births and the number of abortions have decreased in recent decades in Hungary [8]. In the past few years, the number of abortions has decreased more rapidly than the number of live births [Figure 1]. The abortion ratio (the number of abortions per 100 live births) in The Netherlands in 2002 was 6% and in Germany was 9%, whereas in Hungary in 2000 it was 61.5% [3, 4, 8]. Hungary also has a higher abortion ratio than that elsewhere in Central-Europe. Representative surveys have revealed that the rate of use of reliable methods (OCs, intrauterine devices [IUDs] or sterilisation – according to their Pearl index) was 73% in the UK and 75.7% in Germany in 1992 (Oddens) (Table 1). In 1995, 36% of women were not using a contraceptive method in the USA [12], whereas in Hungary in 1992, according to a representative survey conducted by the Hungarian Statistical Office, the rate of use of reliable

contraceptives was 63.5% [4]. The popularity of sterilisation in men in the UK has recently become more popular than that in women [13], whereas in the USA both types have become more and more popular [14]. The user has no role in the occurrence of unwanted pregnancy after the application of sterilisation, injection or an IUD (a definite method failure), and consequently the abortion rate in the USA has been decreasing. The easy access to modern contraceptive methods in Hungary is comparable with that in other industrialised European countries, and it is therefore difficult to explain the significantly higher induced abortion ratio in Hungary.

Table 1. The contraceptive methods applied by fecund, non-pregnant, sexually active women in various European countries [3,4]

	Hungary (1992)	Sweden (1994)	UK (1992)
OC	40.5%	38.4%	39.0%
IUD	20.0%	20.7%	7.3%
Sterilisation	3.0%	5.1%	26.1%
Diaphragm	0.7%	1.0%	1.0%
Condom	9.0%	21.6%	19.8%
Periodic abstinence	2.9%	6.2%	1.5%
Withdrawal	7.3%	2.8%	1.1%
Other methods	0.2%	0.0%	0.0%
No method	16.4%	1.9%	3.6%

For combined methods, the more reliable method was considered

Figure 1. Demography of reproductive characteristics in Hungary

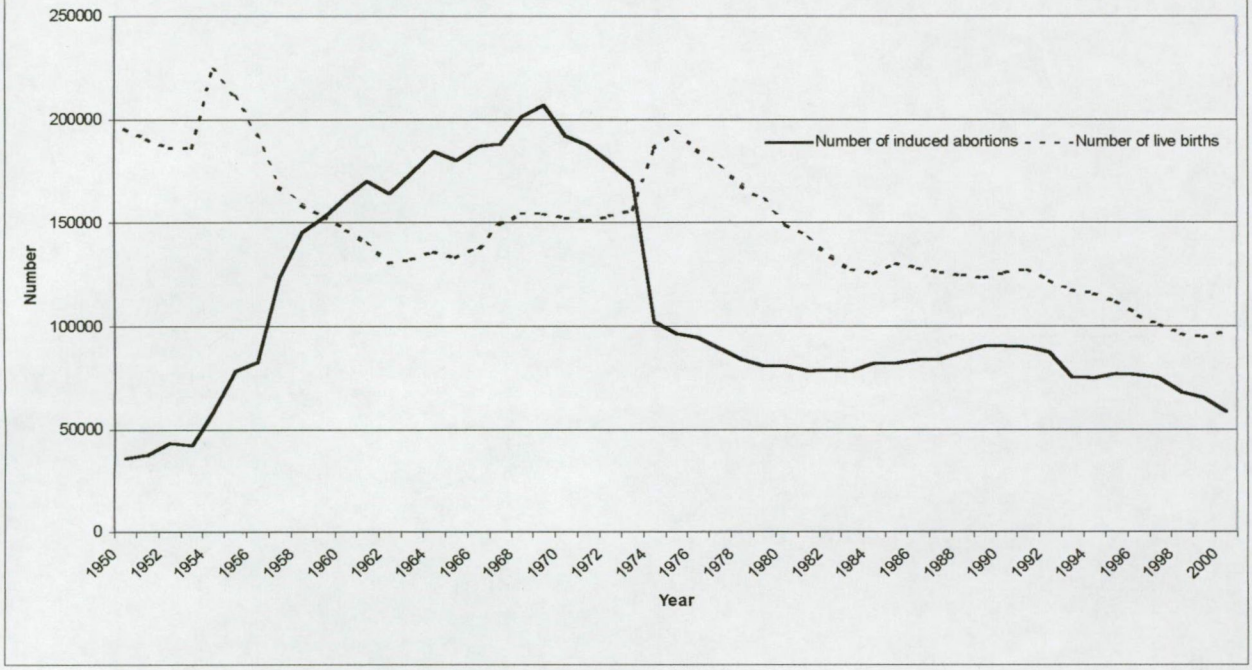


Figure 2. Percentage distribution of abortions in Hungary in 1987 and in 1998

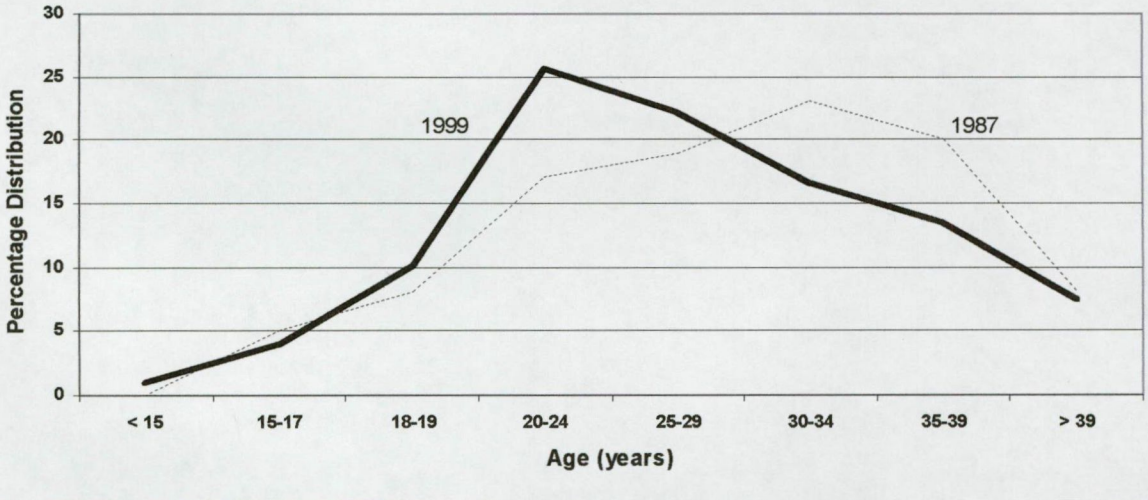
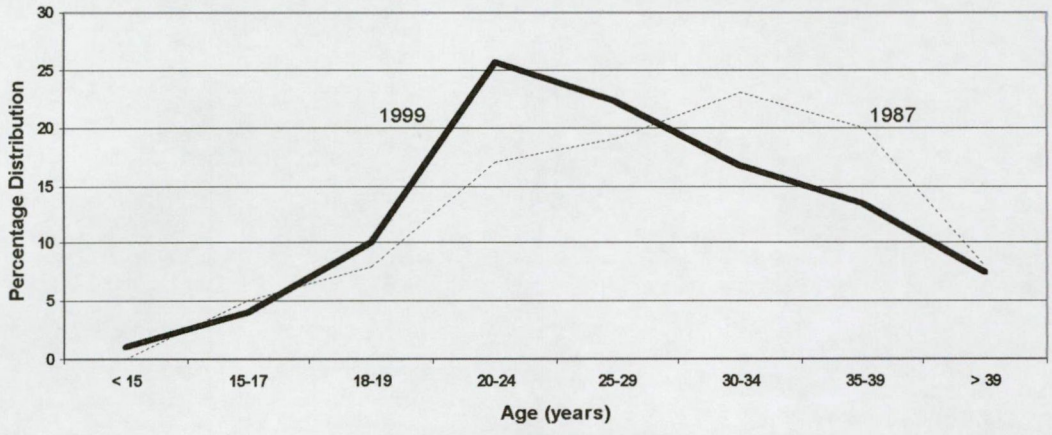


Figure 2. Percentage distribution of abortions in Hungary in 1987 and in 1999



1.2. Contraceptive behaviour of teenagers

During the past 10 years, a shift towards a younger age has been observed as concerns requests for artificial (surgical or medical) abortion in Hungary [Figure 2], possibly because of the acceleration in the attainment of the sexarche and the menarche. However, the rate of termination of pregnancy among teenagers has recently (from 1998 to 2003) decreased [9]. The overall number of abortions has decreased during the past decade, but the abortion ratio among teenagers (the number of induced termination of pregnancy among teenagers - <20 years old - relatively to the total) is still above 10% [8]. Throughout most of the world, sexual behaviour has changed in the recent past [15]. A Scottish research survey has confirmed that teenagers least well understand how to use oral contraceptive pills correctly or realise their benefits [16]. It is of paramount importance to prevent unwanted pregnancy amongst teenagers, in order to protect their reproductive health.

1.3. Advanced maternal age: risk factor during pregnancy?

Pregnancies in which factors exist that can increase the likelihood of abortion, foetal death, premature labour, intrauterine growth retardation (IUGR), foetal or neonatal disease, congenital malformations, mental retardation or other handicaps are termed high-risk pregnancies. Demographic factors associated with high-risk pregnancy include a lower socio-economic status, the marital status (single mothers), the maternal age (a primigravida aged 35 years or older, a gravida aged 40 years or older), the maternal weight (a non-pregnant weight < 45 kg or > 90 kg), the stature (a height < 150 cm), malnutrition, or a poor level of physical fitness. A past pregnancy history associated with a high-risk pregnancy can reveal grand multiparity, antepartum bleeding after 12 weeks of gestation, premature rupture of membranes, previous Caesarean section or low- or mid-forceps delivery, prolonged labour, a previous infant with cerebral palsy, mental retardation, birth trauma, a central nervous system disorder or congenital anomaly, reproductive failure (infertility, recurrent abortion, foetal loss, stillbirth, or neonatal death), or preterm (less than 37 weeks) or post-term (more than 42 weeks) delivery. A past or present medical history associated with a high-risk pregnancy may involve hypertension or renal disease or both, diabetes mellitus (overt or gestational), cardiovascular disease (rheumatic, congenital or peripheral vascular), pulmonary disease producing hypoxaemia and hypercapnia, thyroid, parathyroid and endocrine disorders, idiopathic thrombocytopenic purpura, neoplastic disease, hereditary disorders, collagen disease and epilepsy. Toxaemia, asymptomatic bacteruria, anaemia or haemoglobinopathy, Rh sensitisation, habitual smoking, drug addiction, chronic exposure tío any pharmacologic or chemical agent, multiple pregnancy, viral infection, intercurrent surgery and anaesthesia, placental abnormalities and uterine bleeding, an abnormal foetal lie or presentation, foetal anomalies, oligohydramnios, polyhydramnios, abnormalities of foetal or uterine growth or both, maternal trauma or maternal emotional crisis during pregnancy are additional obstetric and medical conditions which contribute to the development of high-risk pregnancies [17, 18].

On the basis of their history, 10-25% of pregnant women can be identified as at "high risk". Importantly, more than 50% of perinatal pathologies are associated with these pregnancies. Though an assessment of antepartum risk factors is important with a view to the reduction of perinatal mortality and morbidity, some women become high-risk cases only during labour and delivery. Hence, careful monitoring is critical throughout the intrapartum course [19].

This can be explained by the career-oriented lifestyle of women, social and economic reasons, and the ever wider application of assisted reproductive techniques (ARTs). This is so despite the fact that pregnancies in primiparous women aged over 35 or 40 have been regarded as high-risk pregnancies because of the elevated risk of chromosomal abnormalities and pregnancy complications [20].

Maternal age, parity, social class and ethnicity are interrelating and interacting sociodemographic factors that influence maternal health and child-bearing. Advanced maternal age is a risk indicator rather than a risk factor. It is associated with a number of pregnancy complications, including miscarriage, chromosomal abnormalities, twins, uterine fibroids, hypertensive disorders, gestational diabetes, prolonged labour, cephalopelvic disproportion necessitating operative delivery, bleeding disorders including placenta previa, low birth weight, ante- and intrapartum foetal loss and neonatal mortality. In 1958, the Council of the International Federation of Gynaecology and Obstetrics recommended that the age of 35 years should be accepted as the international standard for the 'elderly' nullipara [21]. Whereas in the late 1960s and early 1970s there was a fall in the number of live births in the industrialised countries and an increase in the proportion of mothers aged 35 and over [22], in the last two decades there has been a trend towards deferred childbearing, especially among healthy, well-educated women with career opportunities [23-25]. In former days, pregnant women aged 35 and over tended to have several, unplanned children, whereas today there is a growing proportion of first births to elderly pregnant women. Mainly as women pursue educational, career goals and late marriage, the childbearing age has shifted towards the age of 40 [17, 21, 26, 27]. A similar tendency has recently been observed in Hungary [10]. Some studies have described a more frequent adverse pregnancy outcome in older primigravida [28], whereas other studies have found no difference in pregnancy outcome between younger and older women [29]. There is a consensus that older women are at an increased risk of Caesarean section, gestational diabetes and hypertension [30, 31]. Most recent publications generally concluded that the neonatal outcome (low birthweight, preterm birth and IUGR) does not seem to be affected by the mother's age [20]. However, the risk factors for IUGR and preterm birth in this age group have not been analysed.

In Hungary, pregnancy at 40 or over accounted for only 0.8% of the total number of pregnancies between 1971 and 1982 [8]. In the period between 1995 and 1999, the pregnancy rate in the 40 years or older group was 1.4% in the country overall, and 2.5% in our Department.

The objective of prenatal care is to ensure that every wanted pregnancy is given the maximum chance to culminate in the delivery of a healthy baby, without impairing the health of the mother. The association between a lack of prenatal care and the increasing rate of maternal and foetal morbidity has been recognised for almost half a century. Eastman [20] observed in 1947 that the prematurity rate among no-care patients was 24%, but only 8% among those attending three or more prenatal visits. Tokuhata et al. [32] studied birth certificate data on 185,000 deliveries and found a 23.6% prematurity rate among women not participating in prenatal care, as compared with 6.9% among those with care. In 1980, Ryan and co-workers [33] observed that the group of women with inadequate prenatal care had significantly higher foetal, neonatal, and perinatal mortality rates. Moore and co-workers [34] found that neonates of women who received no care exhibited a significantly greater morbidity than that among the babies of women attending prenatal services, including an increased incidence of premature rupture of the membranes and preterm delivery (13% vs. 2%), low birth-weight (21% vs. 6%) and intensive care unit admission (24% vs. 10%). A number of studies which have varied in design, population base, definitions and data analysis have provided mixed results in accurately identifying pregnant women at risk [24, 35]. However, some individual risk factors are well defined as being correlated with an increased incidence of preterm labour in the developed countries [36].

2. Aims of the study

The primary purpose was to identify the determinants of the termination of pregnancy and contraceptive specifics in Hungary. We set out assess:

1) The influencing factors through which we can improve the unexpectedly high abortion ratio (especially among jeopardised groups: teenagers, repeat aborters and older women) despite the wide range of modern and effective contraceptives available, in an attempt to explain this paradox.
2) The determinants of contraceptive specifics in Hungary, by means of a logistic regression method.
3) Through the intervention points, we can interfere in the contraceptive practice of the focused groups.
4) The determinants of the choice of contraceptives among teenagers and repeat aborters so as to promote the primary prevention of unwanted pregnancy.

The present thesis was initiated to investigate family planning methods applied by women requesting abortion, to determine the prevalence of repeat abortion and to identify the predictors of the termination of pregnancy. We documented the aetiology and clinical features of older pregnancy as a high-risk pregnancy with the aim of revealing new approaches to the improvement of the outcome of these pathologies and review the risk factors implicated in the perinatal and pregnancy outcome of pregnancies of primiparous women aged 35 or over.

3. Materials and methods

3.1. Studies of contraceptive methods used by women requesting abortion

A case-control study was performed to analyse the demographic and contraceptive determinants of abortion, with an anonymous questionnaire survey based on a personal interview carried out in the Department of Obstetrics and Gynaecology, University of Szeged, and in the Family Planning Centre in Szeged. A specially-trained medical student or a midwife interviewed every woman requesting abortion who presented at the Family Planning Centre or who was referred directly to the Department from other Family Planning Centres in the surrounding three counties. The interview was based upon the completion of a questionnaire, anonymously, by the cases and also by controls. Of the 871 women requesting abortion, 47 (5.4%) refused to participate, and 24 (2.75%) were not interviewed due to the unavoidable absence of the interviewer. At least an equal number of controls were recruited on the same day from women of reproductive age (15-49 years) who were a) treated in the Department of Obstetrics and Gynaecology for reasons other than abortion, b) visiting the Department for any reason, or c) accompanying aborters to the Family Planning Centre in Szeged. We excluded women aged less than 15 or over 48. 1,445 women were invited to complete the questionnaire as controls, of whom 134 (9.3%) refused to participate. Women were excluded if they had a previous abortion in their medical history (202, 13.9%) or impaired fertility (109, 7.5%). The remaining 1,000 women were self-defined as non-sterile, sexually active and not pregnant or not wishing to become pregnant at the time of the survey (between 1 October 1998 and 31 March 1999).

The questionnaire was used to evaluate the sociodemographic characteristics, contraceptive use and the depth of knowledge and attitude of the respondents concerning contraception. Aborters were asked about the method used in the conception cycle before

abortion. The contraceptive methods used by the control group in the past three months were also of interest. The questionnaire was approved by the Ethical Committee of the University of Szeged, and informed consent was obtained from the women recruited into the study.

3.1.1. Statistical analysis

Statistical analysis was performed with the SPSS for Windows program [37]. Univariate comparisons were assessed by the unpaired t test and by the χ^2 test for continuous and categorical variables, respectively. Odds ratios (ORs) and 95% confidence intervals (CIs) were also calculated for categorical variables. Multiple logistic regression analysis was used to assess simultaneously the demographic and contraceptive characteristics of the women requesting abortion and the controls [37], and consequently a best predictive model including social and contraceptive factors determining abortion. As far as we are aware, this is the first study to use a logistic regression analysis model to evaluate the determinants of the contraceptive background of artificial abortion and in reproductive medicine. The independent factors studied were the age, marital status, level of education, number of children, currently-used reliable method, awareness of all reliable methods, religious and financial dependence, sources of information concerning the currently-used contraceptive, and knowledge of menstrual cycle. All variables were adjusted for age. For logistic regression, categories of contraceptive use, awareness of contraceptives and source of information were collapsed into a smaller number of categories for better criteria for entry into and interpretation of the model. The model of logistic regression was gained by a stepwise procedure, and the specific interactions of interest were then investigated to improve the model. Statistical significance was defined at the two-sided $P = 0.05$ level.

3.2. Studies of contraceptive methods used by teenagers

The teenager study lasted from 1 October 1998 to 1 May 2000, during which an attempt was made to recruit 1,341 women consecutively seeking artificial abortion; 141 (10.5%) were unwilling to participate and were not interviewed. Of the 1,749 randomly selected requested controls, 196 (11.2%) refused to participate in the program, 167 (9.9%) potential controls were excluded due to a previous abortion, and 186 (11.0%) women were infertile at the time of the survey. 1200 (68.6%) completed the questionnaire. The number of teenagers in the abortion group was 146 (12.2%), while that in the control group was 147 (12.3%). The determinants of contraception were detected amongst the teenagers in both the would-be aborter and the control group, and compared with those for the elder women.

3.2.1. Statistical analysis

The Mantel-Haenszel test was used to estimate the correlation of variables between the teenagers and the women more than 20 years old relative to the correlation in the case-control group. Multiple logistic regression analysis was used to evaluate the factors determining abortion. Differences between characteristics of aborters and controls were estimated with the χ^2 test. Statistical significance was defined at the two-sided $P < 0.05$ level. ORs were also calculated.

3.3. Studies of contraceptive methods used by repeat aborters

The research was carried out by means of a questionnaire to obtain sociodemographic and contraceptive characteristics. The data concerning the participants, circumstances were the same as in the teenager study. The study group was divided into two subgroups: repeat aborters (n=553) and first-time abortion patients (n=647).

3.3.1. Statistical comparisons

Statistical comparisons of the cases and controls were made via χ^2 tests and t probes. ORs and CIs were also given, according to the $P < 0.05$ significance level. Multiple logistic regression, was used to evaluate the factors determining repeat abortion.

3.4. Studies on pregnancies of older mothers

9231 women delivered in our Department, from January 1995 to December 1999 and 230 (2.5%) of these women were aged 40 or older and 3 women had twins. The rate of nulliparous women was 20%. We selected a control group from among women aged between 20 and 29 according to the gravidity and parity. The two samples were fully comparable. We examined the following antepartum complications: gestational diabetes mellitus, toxaemia, myoma, placenta previa, malpresentation, placental abruption, premature rupture of the membrane, intrauterine infection, and oligo- and polyhydramnios. We assessed the following intrapartum complications: Caesarean section, foetal distress, foetopelvic disproportion, retained placenta, prolonged labour and prolonged second stage. Macrosomia was judged as a birth weight equal to or higher than 4,000 g. Small for date was defined as a birth weight below the tenth percentile for that gestational age, according to the sex and to the Hungarian data [9, 37]. IUGR was defined as a birth weight below the tenth percentile for that gestational

age, according to the sex and to the Hungarian data [9]. Preterm delivery was taken as birth before the completion of 37 weeks. Intrauterine infection was considered when the mother had fever and leukocytosis, and the neonate had tachycardia. Foetal distress was defined as the presence of repetitive late decelerations, severe variable decelerations and/or persistent foetal tachycardia. The body mass index was calculated as the body weight (kg) per height (m squared).

The 10,882 neonates delivered from January 1995 to December 2000 in the Department of Obstetrics and Gynaecology included 207 neonates (1.9% of the total) of 194 primiparous mothers aged 35 or over. The study group was divided into two groups: induced pregnancies (n=62) and spontaneous conception (n=132). Eleven women had twins and 1 had triplets in the induced group, while 4 mothers in the spontaneous group had twins.

4. Results

4.1. Studies on contraceptive behaviour of women requesting abortion

Table 2 provides an overview of the general demographic data. The control and case groups were fully comparable as concerns age and residential area. A majority of the women requesting abortion (66%) and of the controls (66.5%) lived in towns and they belonged predominantly in the age group 20-29 years (48.4% and 49.9%, respectively).

Table 2. Selected demographic data on women requesting abortion and on the women in the control group

	Respondents in abortion group (N=800)		Respondents in control group (N=1,000)	
	n	%	n	%
Age range (years)				
15-19	110	13.8	111	11.1
20-24	204	25.5	228	22.8
25-29	183	22.9	271	27.1
30-34	151	18.9	170	17.0
35-39	87	10.9	135	13.5
40-44	55	6.9	81	8.1
45-49	10	1.3	4	0.4
Residential area				
Szeged	391	48.9	476	47.6
Other town	137	17.1	188	18.8
Village	260	32.5	311	31.1
Farmhouse	12	1.5	25	2.5

4.1.1. Education, marital status, number of children

Aborters were characterised by a lower level of education: a college or university rate of 6%, as compared with 16.6% for the controls. Abortion was more frequent among the unmarried women (57.9%) as compared with the controls (47.8%). There were fewer nulliparous women among the aborters (32.8%) than among the controls (43.7%) (Table 3).

Table 3. Education and family characteristics of women requesting abortion and controls

	Abortion group (N=800)		Control group (N=1,000)	
	n	%	n	%
Level of education				
Primary	140	17.5	123	12.3
Secondary	612	76.5	711	71.1
College or university	48	6.0	166	16.6
Marital status				
Single	292	36.5	263	26.3
Married	337	42.1	524	52.4
Cohabiting	78	9.8	142	14.2
Divorced	84	10.5	37	3.7
Widow	9	1.1	34	3.4
Number of children				
0	262	32.8	437	43.7
1	157	19.6	215	21.5
≥2	381	47.6	270	34.8

4.1.2. Contraceptive methods

Table 4. Contraceptive use pattern in women requesting abortion and controls

	Contraceptives	Abortion group (N=800)		Control group (N=1,000)		P value	OR*	95% CI*
		n	%	n	%			
Reliable methods	OCs	145	18.1	443	44.3	< 0.001	0.28	0.24-0.35
	IUDs	14	1.8	100	10.0	< 0.001	0.16	0.09-0.28
	Female sterilisation **	0.0	0.0	6	0.6			
	Injection **	0.0	0.0	1	0.1			
Less reliable methods	Condom	216	27.0	175	17.5	< 0.001	1.74	1.39-2.18
	Periodic abstinence	131	16.4	61	6.1	< 0.001	3.01	2.19-4.15
	Withdrawal	98	12.3	53	5.3	< 0.001	2.49	1.76-3.53
	Diaphragm **	3	0.4	0	0.0			
	Spermicides **	0	0.0	2	0.2			
	Vaginal douche	2	0.3	2	0.2	1.00	1.25	0.18-8.90
	No method	191	23.9	157	15.7	< 0.001	1.68	1.33-2.13

* OR: odds ratio, CI: confidence interval

** Fisher's test was not performed, because the number of entries was small

OCs and IUDs were used significantly less frequently in the aborter group than in the controls (18.1% vs. 44.3% [OR: 0.278, 95% CI: 0.244-0.346]; 1.8% vs. 10% [OR: 0.16, 95% CI: 0.091-0.283]), respectively. The proportions of the three most frequently used less reliable methods (condom, periodic abstinence and withdrawal) were 55.7% for the aborters and

28.9% for the controls. No contraceptive method was used by 23.9% of the aborters and 15.7% of the controls (Table 4).

Unwanted pregnancy had occurred among OC users in 138 (95.2%) cases as a consequence of patient failure (missing one or more pills or starting the pills on the wrong day, vomiting or diarrhoea after taking the pill, or the use of medication which interfered with the efficacy of the pill), and in 7 (4.8%) cases as a consequence of method failure among the aborters. Pill users in the control group reported a 1.8% patient failure rate during use in the last month (Table 4).

4.1.3. Knowledge of the menstrual cycle and religious dependence

Knowledge of the fertile period in the menstrual cycle may be necessary in order to use the periodic abstinence techniques (calendar method, withdrawal or periodic abstinence) successfully. The women were asked whether they were aware of the least and the most fertile periods in the menstrual cycle. Adequate knowledge was possessed by 14.1% of the women requesting abortion and 20% of the controls. In our survey, religion did not influence the contraceptive choice among either the aborters or the controls (2.5% vs. 3%) (Table 5).

Table 5. Relationship of probable risk factors to case-control status in women requesting abortion and controls

Characteristics	Abortion group (N=800)		Control group (N=1,000)		P value	OR*	95% CI*
	n	%	n	%			
Adequate knowledge of the menstrual cycle	113	14.1	207	20.7	< 0.001	0.63	0.50-0.80
Religious dependence	20	2.5	30	3.0	0.57	0.80	0.50-1.40

* OR: odds ratio, CI: confidence interval

4.1.4. Awareness and source of information concerning contraception

A vast majority of the interviewed women (with the exception of the youngest) were aware of almost all the contraceptive forms (Table 6). Half of the patients (54%) identified two or more sources of information concerning contraceptive knowledge; there was a significantly higher impact on non-aborter women. Table 7 summarises the results. The most common sources were the written media and the partner in the abortion group, whereas a girl-friend and the electronic media were the most important sources of information amongst the controls.

Table 6. Awareness of contraceptives among women requesting abortion and controls

Contraceptives	Abortion group (N=800)		Control group (N=1,000)		P value	OR*	95% CI*
	n	%	n	%			
OC pills	800	100	998	99.8	1.00	1.00	0.99-1.00
IUDs	789	98.6	998	99.8	0.004	0.14	0.03-0.65
Sterilisation	750	93.8	979	97.9	< 0.001	0.32	0.19-0.54
Condom **	800	100	1000	100			
Withdrawal	776	97	970	97	1.0	1.00	0.58-1.72
Periodic abstinence	720	90	960	96	< 0.001	0.37	0.25-0.55
Diaphragm	680	85	906	90.6	< 0.001	0.59	0.44-0.78
Vaginal douche	726	90.8	942	94.2	0.006	0.60	0.42-0.86
Spermicides	623	77.9	832	83.2	0.005	0.71	0.56-0.90

* OR: odds ratio, CI: confidence interval

** Statistical analysis was not meaningful due to the equal number of entries in the two groups

Table 7. Sources of information on currently-used contraceptive method among women requesting abortion and controls

Source of information **, †	Abortion group (N=800)		Control group (N=1,000)		P value	OR*	95% CI*
	n	%	n	%			
Newspapers and books	396	49.5	699	69.9	< 0.001	0.42	0.35-0.51
Partner	340	42.5	714	71.4	< 0.001	0.30	0.24-0.36
Girl-friend	289	36.1	769	76.9	< 0.001	0.17	0.14-0.21
Electronic media	216	27.0	767	76.7	< 0.001	0.11	0.09-0.14
Health-care workers ‡	195	24.4	600	60.0	< 0.001	0.21	0.17-0.26
Family	163	20.4	614	61.4	< 0.001	0.16	0.13-0.20
Teacher, school ‡	67	8.4	490	49.0	< 0.001	0.09	0.07-0.13
Others	74	9.3	720	72.0	< 0.001	0.04	0.03-0.05

* OR: odds ratio, CI: confidence interval

** Women not using any method had no source of information

† Among women using combined methods, we mapped the source of information of both or more contraceptives

‡ 11 cases attended special health schools and their source of information was included in each of two categories

‡ The women could identify more than one source of information

4.1.5. Logistic regression model

The multiple logistic model characterising the determinants of abortion can be seen in Table 8. Interestingly, the logistic regression indicated that knowledge of the menstrual cycle, other sources of information (i.e. sources other than a health-care provider and the media) and religious dependence were not significant as concerns abortion, although adequate knowledge of the fertile period of the menstrual cycle and other sources of information concerning contraception were significant by the univariate methods. Knowledge of the menstrual cycle is

Table 8. The logistic regression model among women requesting abortion (N=800) and controls (N=1,000)

Variable	P value**	Unadjusted OR*,**	95% CI*,**	P value	Adjusted OR*	95% CI*	B
Age	< 0.001			<0.001	0.92	0.90-0.95	- 0.08
Married	< 0.001	0.66	0.55-0.80	<0.001	0.58	0.45-0.75	-0.54
Education †				< 0.001			
Elementary school	< 0.001			0.288	0.77	0.47-1.25	- 0.27
Secondary school				< 0.05	1.72	1.18-2.53	0.55
Number of children	< 0.001			<0.05	0.59	0.36-0.97	- 0.53
Number of children × age ‡				< 0.001	1.04	1.02-1.06	0.04
Use of reliable method	< 0.001	0.2	0.16-0.25	< 0.001	0.46	0.32-0.65	- 0.77
Awareness of all reliable methods	< 0.001	0.3	0.20-0.50	< 0.001	0.25	0.14-0.45	- 1.40
Financial dependence	< 0.001	2.9	2.30-3.50	< 0.001	1.87	1.48-2.36	0.62
Informed by health-care provider	< 0.001	0.2	0.20-0.30	< 0.05	0.56	0.39-0.80	- 0.57
Informed by electronic and written media	< 0.001	3.5	2.80-4,30	< 0.001	0.51	0.39-0.66	- 0.67

* OR: odds ratio, CI: confidence interval

** χ^2 tests and t tests

† Compared to college or university education

‡ Interaction between number of children and age

a confounder. This can be explained by the high correlation with other variables in the model, such as that between the knowledge of the menstrual cycle and the level of education.

The coefficient for age (- 0.0795) shows that abortion is more probable at a lower age. Similarly, the coefficient of the number of children (- 0.5295) shows that the risk of abortion is lower for women of lower age with fewer children. However, the positive sign of the significant interaction terms indicates that abortion is more probable for women of higher age and with a higher number of children.

The OR of abortion is 0.58 for marriage, i.e. the odds of abortion is 0.58 times lower for married women than for unmarried woman. As compared with college- or university-educated women, the odds of abortion is 1.78 times higher for women with secondary education, whereas it is 0.77 times smaller for women with an elementary school education. A low income was unfavourable for the choice of modern methods, and those in the low-income group were more likely to be aborters, with a 1.87-fold odds.

4.2. Studies on contraceptive behaviour of teenagers requesting abortion

4.2.1. Sociodemographic characteristics

Most of the teenagers requesting abortion (60.3%) and the controls (66.0%) were urban residents. A majority of the teenage girls had no children (abortion group: 93.8%, control group: 83.7%) and were single (abortion group: 85.6%, control group: 78.9%). More than half of the teens in both groups were secondary school-educated (6.2%).

The use of reliable contraceptive methods was significantly less frequent among the teenagers than among the older women, but this difference was much more significant ($P<0.001$) for those who requested abortion (OR=0.44) than for the controls (OR=0.51) (Table 9). A majority of the teenagers requesting abortion used condoms (44.5%) or relied on

luck (35.6%), and a lower number used an OC pill (10.9%). Most of the teenage control girls used an OC pill (32.7), a condom (30.6%) or no method (25.2%).

Significantly fewer teenagers (P<0.001) possessed an adequate knowledge of the fertile period of the menstrual cycle relative to the older women in the abortion group (OR=0.20) or those in the control group (OR=0.26). The financial background was not a significant (P=0.082) selection criterion in the choice of contraceptives. The financial aspects of the use of contraceptives were important (about 40%) among the teenagers who sought abortion. Emergency contraception was significantly (P<0.001) less well known among the would-be aborter teenagers as compared with the older women requesting artificial abortion (OR=0.07) than the relevant knowledge of the teenage controls (OR=0.10) (Table 9).

Table 9. Selected contraceptive characteristics in the two groups, compared with the Mantel-Haenszel test

	Abortion group					Control group					
	<20 yrs (N=146)		≥20 yrs (N=1,054)		OR*	<20 yrs (N=147)		≥20 yrs (N=1,053)		OR*	P value
	n	%	n	%		n	%	n	%		
Reliable method	16	10.9	231	21.9	0.44	60	40.8	608	57.7	0.51	<0.001
Adequate knowledge of fertility during menstrual cycle	5	3.4	161	15.3	0.2	11	7.5	249	23.6	0.26	<0.001
Financial dependence	66	45.2	463	43.9	1.08	42	28.6	207	19.7	1.65	0.082
Awareness of EC pills	81	55.5	997	94.6	0.07	93	63.3	1,016	96.5	0.10	<0.001

* OR (odds ratio): ratio of frequencies of variables in a comparison of teenagers and older women

A total of 188 teenagers (97 in the case group and 91 in the control group) were asked about the contraceptives applied during the first sexual intercourse. A majority of the teenage girls surveyed employed less reliable methods (Table 10).

Table 10. Contraceptives applied during first sexual intercourse among teenagers (n=188) *,**

Contraceptive methods	Abortion group (N=97)		Control group (N=91)	
	n	%	n	%
No method	38	39	41	45
Condom	23	23	22	24
OC pill	13	13	13	14
EC pill	6	6	6	7
Withdrawal	5	5	5	5
OC pill + condom	1	1	1	1
Calendar method	1	1	1	1
EC pill + condom	1	1	1	1

* Less reliable methods were considered in combined methods

** Not all teenagers responded

Table 11 relates to the sources from which the girls obtained their knowledge about the currently-applied method. More sources were used by the control teenagers than by those seeking abortion. The teenage aborters gained their knowledge mainly from their sexual partner, the public media or their girl-friends. The main sources for the teenagers in the control group were their girl-friends, the family or the electronic media.

Table 11. Source of knowledge about currently-used method among teenagers*

Source of information	Abortion group (N=146)		Control group (N=147)	
	n	%	n	%
Partner	52	35.6	85	57.8
Written media	51	34.9	73	49.7
Girl-friend	45	30.8	53	63.3
Family	34	23.3	91	61.9
Electronic media	30	20.5	89	60.5
Health-care provider	27	18.5	57	38.8
School	21	14.4	57	38.8
Other	10	6.8	78	53.1

* Combined methods: sources of all contraceptives

Information from a health-care provider was essential in the choice of the OC pill as compared with other methods among both the would-be aborters and the control teenagers (Table 12).

In the future, the teenagers in the abortion group would like to use a condom or an OC pill combined with a condom with an occasional partner, while the girls in the control group would prefer almost the same methods as the would-be aborter teenagers (Table 13).

Table 12. Information provided by health-care providers concerning OC pill

	Abortion group					Control group				
	<20 yrs (N=146)		≥20 yrs (N=1,054)		P value	<20 yrs (N=147)		≥20 yrs (N=1,053)		P value
	n	%	n	%		n	%	n	%	
Informed by health-care providers	10	6.8	17	11.6	<0.001	9	6.12	48	32.7	<0.001

Table 13. Intended contraceptives with an occasional partner in the future among teenagers

	Abortion group (N=146)		Control group (N=147)	
	n	%	n	%
Condom	109	74.7	78	53.1
Condom + OC pill	26	17.8	38	25.9
OC pill	3	2.1	15	10.2
EC pill*	3	2.1	0	0.0
Condom + EC pill*	2	1.4	10	6.8
Condom + spermicides	0	0.0	4	2.7
Withdrawal/diaphragm	2	1.4	2	14

* EC pill: emergency contraceptive pill

4.3. Characterisation of repeat aborters

Table 14 presents the logistic regression model including odds for repeat abortion as compared with first-time aborters. The variable results of the univariate comparison of the application

Table 14. The logistic regression model among women requesting repeat abortion (n = 553) and women in first-time aborter group (n = 647)

Variable	P value**	Unadjusted OR*,**	95% CI*,**	P value	Adjusted OR*	95% CI*	B
Age	< 0.001			<0.001	1.10	1.07-1.14	0.10
Education †				< 0.001			
Elementary school	0.06			0.32	0.83	0.59-1.19	- 0.18
Secondary school				< 0.001	1.15	0.08-0.30	- 1.89
Number of children	< 0.001			<0.001	2.66	1.57-4.50	0.98
Number of children × age ‡				< 0.05	0.98	0.96-0.99	- 0.02
Number of children × married ‡				< 0.05	0.85	0.73-0.99	- 0.16
Awareness of all reliable methods	< 0.001	4.15	2.30-7.50	< 0.05	2.20	1.15-4.22	0.79
Knowledge of fertile period of the cycle	< 0.001	2.46	1.75-3.47	< 0.001	2.05	1.37-3.05	- 3.89

* OR: odds ratio, CI: confidence interval

** χ^2 tests and t tests

† Compared to college or university education

‡ Interaction between number of children and age/married marital status

contraceptives have bee changed in the model. The use of reliable methods was not a significant determinant of repeat abortion as compared with first-time abortion. Sources of

information concerning the method used in the cycle before abortion were grouped into three forms: gaining knowledge from health-care providers, electronic/public media and other sources. All three categories had no influence on the second or later abortion. Marital status, religious dependence and financial background were not significant factors as concerns repeat abortion.

The coefficient for age (0.10) shows that recurrent abortion is more probable at a higher age. The logistic regressions yielded significant associations with a low level of education and repetition of abortion. As compared with college- or university-educated women, the odds of repeat abortion was 1.15 times higher for women with a secondary education, whereas it was 0.83 times smaller for women with elementary school education. The coefficient of the number of children (0.90) shows that the risk of abortion was lower for women of lower age with fewer children. The interaction between the number of children and the age is stronger than that between the number of children and the married marital status. The negative sign of significant interactions terms indicated that repeat abortion was more probable for women of higher age and with a higher number of children or older multiparous women. Interestingly, marriage itself was not a significant determinant in the logistic regression. Despite the earlier termination of pregnancy by abortion, the OR of repeat abortion was 2.20 for the awareness of all reliable methods and the odds of a knowledge of the fertile period of the cycle regarding repeat abortion was 2.05, which means that the advantage concerning contracption does not exempt from repeated mistakes.

4.4. Studies on advanced maternal age concerning pregnancy outcome

The maternal characteristics in the case and control groups are shown in Table 15. The number of pregnancies after assisted reproductive techniques was significantly (almost 5 times) higher in the older group. Similarly, in the older group, more women had participated in higher education, and less in secondary education, the difference in the latter case being significant.

Table 15. General characteristics of deliveries in the two groups

	Age ≥ 35 (N=194)		Age 20-29 (N=194)		P value	OR* 95% CI*
	n	%	n	%		
Married	141	72.7	147	75.8	NS**	0.85 (0.54-1.34)
Education						
Primary school	16	8.2	32	16.5		
Secondary school	110	56.7	141	72.7	< 0.001	
Higher education	68	35.1	21	10.8		
Assisted conception	62	32.0	13	6.7	<0.001	6.54 (3.45-12.38)
Previous abortion	83	40.1	86	41.5	NS**	0.94 (0.64-1.39)
No pregnancy care	1	0.5	5	2.6	NS**	0.20 (0.02-1.69)

* OR: odds ratio, 95% CI: 95% confidence interval. ** NS: not significant

Table 16 reveals modestly increased rates of specific pregnancy complications in the older group as compared with the younger women. The maternal age had little impact on the incidence of gestational diabetes (9.3% vs. 5.2%). The primiparas aged 35 years or older were

more likely to have preeclampsia than the younger primiparous women (17.5% vs. 10.3%), but the difference did not reach the level of significance. There were no perinatal deaths in either group.

Table 16. Pregnancy complications of primiparas agd 35 or older

	Age ≥ 35 (N=194)		Age 20-29 (N=194)		P value	OR (95% CI)*
	n	%	n	%		
Gestational diabetes	18	9.3	10	5.2	NS**	1.88 (0.84-4.19)
Preeclampsia	34	17.5	20	10.3	0.056	1.85 (1.02-3.34)
Myoma	7	3.6	1	0.5	NS**	7.22 (0.88-52.29)
Placenta previa***	1	0.5	1	0.5		
Abruptio placentae***	0	0.0	1	0.5		

*OR: odds ratio, 95% CI. **NS: not significant. *** Statistical analysis was not meaningful

Table 17 gives an overview of the maternal complications. There was no significant difference between the groups in the distribution of premature rupture of the membranes. The infants of the older primiparous women exhibited a higher incidence of malpresentation (11.6% vs. 8.2%) and premature birth (20.8% vs. 15.5%), and a lower rate of IUGR (7.7% vs. 11.1%) than those of the younger primiparous women, though these differences were not statistically significant. The frequency of Caesarean section was significantly higher (2-fold) amongst the older primiparous women (53.6% vs. 25.6%; $P < 0.001$). More newborns needed neonatal intensive treatment in the older group. The incidence of 5-minute Apgar scores <7 was the same (3.9%) for the infants in the two groups. A cord blood gas pH < 7.2 was less frequent amongst the older primiparas (10.7% vs. 21.8%) and the difference was statistically significant. The number of congenital anomalies was low in both groups.

Table 17. Perinatal outcome in the two groups

	Age ≥ 35 (N=207)		Age 20-29 (N=207)		P value	OR (95% CI) ***
	n	%	n	%		
Premature rupture of membranes	75	36.2	89	43.0	NS**	0.75 (0.51-1.12)
Malpresentation	24	11.6	17	8.2	NS**	1.47 (0.76-2.82)
Prolonged labour	19	9.8	17	8.8	NS**	1.13 (0.57-2.25)
Prolonged second stage	12	6.2	18	9.3	NS**	0.65 (0.30-1.38)
Caesarean section	111	53.6	53	25.6	< 0.001	3.36 (2.22-5.09)
Premature delivery	43	20.8	32	15.5	NS**	1.43 (0.87-2.38)
IUGR	16	7.7	23	11.1	NS**	0.67 (0.34-1.31)
NICU transfer	22	10.6	20	9.7	NS**	1.11 (0.59-2.11)
5-minute Apgar < 7	8	3.9	8	3.9	NS**	1.00 (0.37-2.72)
Umbilical cord blood pH < 7.2	22/187*	10.7	45/194*	21.8	0.003	0.43 (0.25-0.74)
Congenital malformation	6	2.9	5	2.4	NS**	0.83 (0.25-2.76)
Gestational age (mean±SD) (week)	37.66±2.93		38.03±2.96		NS**	
Birth weight (mean±SD) (g)	3079±745		3088±808		NS**	
Weight at delivery (mean±SD) (kg)	87.63±15.9		74.24±12.9		< 0.001	

* Measurement was not performed in all cases. **NS: not significant. *** OR: odds ratio, 95% CI: 95% confidence interval

Table 18 displays the results of the multiple logistic regression analysis. The older women had an overall 6.54 times higher risk of Caesarean section. Within the older group,

there was a 17.3 times higher risk of Caesarean section when the fetus exhibited any malpresentation, and a 15.1 times higher risk of Caesarean section when a prolonged second stage of delivery was present. Foetopelvic disproportion, as a risk of Caesarean section, was the third frequent risk factor, with an odds of 8.57, and the likelihood of Caesarean section rose to 5.55 when there was foetal distress, and to 4.29 when there was preterm delivery. Previous abortion influenced the occurrence of Caesarean section, with an OR of 1.96, while premature rupture of the membranes diminished the risk, with an OR of 0.43.

Table 18. Risk factors of Caesarean section in primiparas aged 35 or older according to logistic regression model

Risk factors of Caesarean section	P value	AOR*	95% CI**
Women aged 35 or over (age)	< 0.001	6.54	3.62-11.79
Malpresentation	< 0.001	17.31	7.62-39.32
Prolonged second stage	< 0.001	15.08	5.05-45.06
Foeto-pelvic disproportion	< 0.001	8.57	2.86-25.72
Foetal distress	< 0.001	5.55	2.81-10.94
Preterm delivery	< 0.001	4.29	2.17-8.49
Previous abortion	0.015	1.96	1.14-3.39
Premature rupture of the membranes	0.004	0.43	0.24-0.76

* AOR: adjusted odds ratio. ** 95% CI: 95% confidence interval

We examined, whether the ART methods are somehow responsible for the unfavourable perinatal outcome among induced pregnancies over 35. There was no difference in perinatal outcome between the ART and the non-ART older primiparous women.

Significantly more multiple pregnancies were delivered in the induced subgroup (P=0.005; [OR: 5.43, 95% CI: 1.60-18.41] than in the spontaneous group.

Table 19 presents the pattern of pregnancy complications in the surveyed groups. The prevalences of gestational diabetes mellitus (6.5% vs. 8.3%), preeclampsia (21.0% vs. 14.4%), placenta previa (1.61% vs. 0%), threatened preterm delivery (22.6% vs. 15.2%), meconium-stained amniotic fluid (17.7% vs. 12.9%), postdatism (22.6% vs. 19.7%), myoma (1.6% vs. 4.5%), oligohydramnios (3.2% vs. 5.8%) and polyhydramnios (0% vs. 3.7%) were not significantly different in the two groups.

Table 19. Pregnancy characteristics of ART or spontaneously conceived primiparas aged 35 or older

	Induced group (N=62)		Spontaneous group (N=132)		P value	OR (95% CI)**
	n	%	n	%		
Gestational diabetes mellitus	4	6.5	11	8.3	NS*	0.76 (0.23-2.49)
Preeclampsia	13	21.0	19	14.4	NS*	1.58 (0.72-3.45)
Myoma	1	1.6	6	4.5	NS*	0.34 (0.04-2.92)
Placenta previa***	1	1.6	0	0		
Threatened preterm delivery	14	22.6	20	15.2	NS*	1.63 (0.76-3.50)
Meconium-stained amniotic fluid	11	17.7	17	12.9	NS*	1.46 (0.64-3.34)
Malpresentation	10	16.1	20	15.2	NS*	1.10 (0.47-2.46)
Oligohydramnios	2	3.2	8	5.8	NS*	0.54 (0.11-2.61)
Polyhydramnios***	0	0	5	3.7		
Postdatism	14	22.6	26	19.7	NS*	1.19 (0.57-2.48)

*NS: not significant. **OR: odds ratio, CI: confidence interval. *** Statistical analysis was not meaningful

Table 20 relates to the complications during delivery. The incidences of premature rupture of the membranes (33.9% vs. 37.9%), cephalopelvic disproportion (8.1% vs. 9.8%), prolonged labour (9.7% vs. 9.8%) and a prolonged second stage (9.7% vs. 4.4%) were again significantly different in the two groups. Nor were the frequencies of Caesarean section significantly different (46.8% vs. 61.4%), although the rate here was higher than the overall data for our tertiary centre and for Hungary [9].

Table 20. Intrapartum complications of ART or spontaneously conceived primiparas aged 35 or older

	Induced group (N=62)		Spontaneous group (N=132)		P value	OR (95% CI)**
	n	%	n	%		
Premature rupture of the membranes	21	33.9	50	37.9	NS*	0.84 (0.45-1.58)
Cephalopelvic disproportion	5	8.1	13	9.8	NS*	0.80 (0.27-2.36)
Caesarean section	29	46.8	81	61.4	NS*	0.55 (0.30-1.02)
Prolonged labour	6	9.7	13	9.8	NS*	0.98 (0.35-2.71)
Prolonged second stage	6	9.7	6	4.4	NS*	2.30 (0.71-7.45)

*NS: not significant. **OR: odds ratio, CI: confidence interval

Table 21. Neonatal outcome of ART or spontaneously conceived primiparas aged 35 or older

	Induced group (N=72)		Spontaneous group (N=135)		P value	OR (95% CI)**
	n	%	n	%		
Gestational age (mean±SD) (weeks)	37.75±2.97		37.43±2.97		NS*	
Birth weight (mean±SD) (g)	3,168±831		2,968±748		NS*	
Preterm birth	18	25.0	25	18.5	NS*	1.47 (0.74-2.92)
IUGR	6	8.3	15	11.1	NS*	0.73 (0.27-1.96)
5-minute Agar score < 7	6	8.3	4	3.0	NS*	2.98 (0.81-10.92)
Male newborns	41	56.9	76	56.3	NS*	1.03 (0.58-1.83)
Cord blood pH > 7.20***	7/66	10.6	17/123	13.8	NS*	0.74 (0.29-1.89)
NICU admission	12	16.7	16	11.9	NS*	1.49 (0.66-3.35)
Congenital malformations	2	2.8	3	2.2	NS*	1.26 (0.21-7.70)
Perinatal mortality ****	0	0	0	0		

*NS: not significant. **OR: odds ratio, CI: confidence interval. ***Examination was not performed in every case. **** Statistical analysis was not meaningful

Table 21 provides an overview of the neonatal outcome in the two groups. The mean birth weight of the infants (3168±831 g vs. 2968±748 g), the gestational age at delivery (37.75±2.97 weeks vs. 37.43±2.97 weeks), the rates of preterm birth (25.0% vs. 18.5%), the IUGR (8.3% vs. 11.1%) and the Apgar score at 5 min. < 7 (8.3% vs. 3.0%) did not differ

significatly between the two groups. Perinatal mortality did not occur in both two study groups. NICU admission (16.7% vs. 11.9%) and congenital malformations (2.8% vs. 2.2%) was not significantly more among ART pregnancies. The male:female ratio was higher in the induced group, but not significantly so.

5. Discussion

5.1. Studies on contraceptive behaviour of women requesting abortion

As reported by van Bogaert, abortion can be caused by failed contraception use [39]. Even though effective contraceptives are quite common in Hungary, aborters apply them less frequently as compared with the control group. A considerable proportion of pill users are not sufficiently familiar with how to use the pill. Our survey revealed a very high user-dependent failure rate (1.8%), which was significantly higher than in the total population reported by Guillebaud (0.25%) or van Bogaert (0.18%), explaining the unexpectedly high abortion rate among OC users, despite the reliability of this contraceptive [40]. The effectiveness of OC requires contraceptive counselling to improve the compliance of this method [41]. OC use is characteristic for women in their twenties-thirties, whereas the highest IUD and sterilisation rates are among women over 30. The prevalence of less reliable contraceptives is higher among adolescents and older women. Women who opt for sterilisation do not wish to have any more children, as is apparent among women with more children. Application of IUDs is similarly connected with childbearing (and indirectly with the age), like sterilisation. When the contraceptive choice of the controls in our study is compared with that in the Hungarian national survey, it can be concluded that contraceptive practice in Hungary has not improved greatly in recent years. Although our control group was matched with the aborters, the modern, reliable methods were used much less used by our controls than in the Hungarian national survey [4]. Urban women are more likely to use effective contraception than rural women according to our results, as in Vietnam [42], Nigeria [43] and Kenya [44].

However, it was found that adolescents and older women who wished to avoid pregnancy were nevertheless especially likely not to be using any contraceptive method at all. Adolescents and young women remained the predominant risk group for unintended pregnancies and subsequent abortion. Since teenagers do not normally rely on sterilisation and IUDs, the only reliable possibility against unwanted pregnancy for them is the OC. Generally, during their initial reproductive age they use inconsistent, unreliable methods (condom, withdrawal or no method), but they have a defective knowledge of contraception. Most sexually active adolescents appear to adopt the pill after some years.

Wilcox et al. reported that the chance of fertility is highest between days – 5 and + 1 of ovulation [45], which information is necessary for the reliable management of unreliable or inconstant contraceptive procedures. In our surveyed groups, the awareness of fertility and contraception was very weak.

Our logistic regression analysis demonstrated that the risk of unintended pregnancy generally declines with age, depending on the number of children. Married women have a lower risk of abortion. One of the most important influencing factors is a poor financial background. A considerable proportion of the surveyed women could not afford to buy modern and effective contraceptives. We found that the awareness of all reliable methods among the aborters was significantly less than that among the controls.

Our study revealed that a single marital status, childlesness and urban residency are mostly represented among would-be aborter teens. Teenagers usually prefer less reliable birth control methods and they pay less attention to using a reliable method, or to using a less reliable method correctly. Teenagers are less likely to use any contraceptives, as seen in our study and also in Vietnam [42].

According to our study, the first steps in their sexual life are commonly unsafe and characterised by a lack of experience. First sexual intercourse is more protected in Australia (80%) [46] by the teenagers than in our results (61%). The attitude of teenagers towards OCs is very unfavourable, because of an exaggerated fear of the unwanted side-effects of the pill. The fertile period of the menstrual cycle proved less well known among the women seeking an artificial abortion, which is important as concerns the correct usage of less reliable methods. In respect of the financial background, the Mantel-Haenszel test did not reveal a significant difference between the teenagers and the older women. Multifactorial analyses demonstrated that significantly fewer teenagers in the abortion group were aware of EC pills. The attitude towards EC pills is not appropriate, despite their efficacy as compared with less effective methods, which is also underestimated in this reproductive age range in the USA [47].

A majority of the first sexual contacts of the respondents were unprotected or protected by unsafe methods. According to our results, the use of OC or EC pills in first cases is very rare. Teenagers would mostly like to use an OC pill and condom with an occasional partner. The poor contraceptive knowledge and the little experience concerning contraception may explain the more incorrect and irregular usage of contraceptives. Communication with the parents and the role of education are negligible in providing safe contraception. Most teenagers need more instructional support from the education system and health-care providers, as in other countries [48, 49]. The need for abortion did not change the attitude towards contraceptives, and teenage girls seeking abortion mostly want to use less reliable methods with an occasional partner in the future.

Our study highlights that the education of adolescents with regard to proper contraception does not seem to be effective enough for them to choose a reliable method. The

sexual development of teenagers demands more support from physicians and more family instructions and advice in order to prevent abortion. In Hungary, the social and cultural effects exert a less favourable influence on the contraceptive use and choice amongst teenagers. Sweden has almost the lowest abortion rate: sex-educational programmes concerning contraceptive use have been introduced in schools [50]. Torres reported a detailed promotion model against unwanted pregnancy among teenagers, including education and psychological elements [51]. The median age of the menarche is decreasing [4], as is that of the sexarche. This emphasises the need for the improvement of the education of adolescents as concerns contraception for the prevention of unwanted pregnancy. Reliable methods such as EC pills, or the accurate use of less reliable methods, should be promoted. Double protection (OC and condom) should also be propagated among teenagers [52].

The true advantages and disadvantages of OCs, IUDs, sterilisation and injection need to be brought to the attention of the lay public more effectively. Our results highlighted that doctors and nurses are the most important sources of information concerning contraception, followed by the media. A higher educational level and a higher number of children promote the application of modern contraceptives and better information on their correct use [42].

Improvement of attitudes toward contraception, persuasion to use modern contraception and promotion of contraceptive effectiveness are recommended strategies to prevent repeat induced abortion. In contraceptive counselling procedures, all women of reproductive age need to be guided as to the proper contraceptive. Double or emergency protection against unwanted pregnancy could be effective amongst teens, as in the USA, to prevent the repetition of termination of pregnancy [53].

We can conclude that, in spite of the widespread availability of modern and effective methods in Hungary, the abortion ratio is high. Generally, the efficacy of contraceptives is closely related to their correct use. Thus, the unfavourably high abortion ratio could be explained in part by the incorrect and inconsistent use of the effective methods. The failure rate of injection or sterilisation is lower than that of IUDs or OCs. Efforts need to be directed to the mass media to inform women and their partners concerning effective and regular contraception, which could help in extending the use of modern, effective contraceptives. Education programmes in the schools should furnish information on modern contraceptives, appropriate knowledge of the menstrual cycle and how to use less reliable methods correctly in order to decrease the number of abortions. Previous research has shown that the use of unreliable contraception [54] presents a higher risk of abortion, but less reliable methods may be suggested for women with contraindications to OC and IUD.

5.2. Studies on older primiparas

More pregnancies were concluded preterm in the older group, but there was a lower incidence of IUGR in the older group. Neither of the variables was significantly different. Some authors have claimed that this high-risk pregnancy is associated with a significantly higher incidence of preterm birth and IUGR [23, 25, 55, 56].

Many reports have described a higher incidence of Caesarean delivery [23, 25, 29, 55, 56]. Our study shows that first-time mothers who give birth at the age of 35 or older are at high risk of Caesarean delivery. The frequency of Caesarean delivery was about 2 times higher in the case group than in the younger one. However, this is more than 2.5 times higher than the Hungarian average [9]. The higher rate of Caesarean delivery among the controls is due to the fact that our

Department is a tertiary centre. Multiple regression analysis was performed to determine risk factors of Caesarean section. The chance of Caesarean section was 6.5 higher than in the control group, 17.3 times higher when the fetus displayed malpresentation, and 15.1 times higher when a cephalo-pelvic disproportion was present.

The findings shows that primiparous women aged 35 or over generally have slightly more pregnancy and perinatal complications, but do not have a worse outcome as compared with younger mothers. The differences seem to accumulate as overall higher risk factors of Caesarean delivery.

The retrospective study, including the rates of complications of pregnancy and the neonatal outcome among older primiparas in respect of ARTs, furnished various results.

Caesarean section was more frequent as compared with the Hungarian and clinical average. Many other reports have likewise described a significantly higher rate of Caesarean delivery among older women. Some authors suggest that the management of labour in older women may differ in some way from that in younger women [23]. The physician may be more anxious and more careful, but this hypothesis is difficult to evaluate.

The incidence of preterm birth was slightly higher, while that of IUGR was lower in the induced group, but these determinants did not exhibit a significant difference. The rates of premature birth and IUGR were high as compared with the rates for an average Hungarian tertiary centre and the recent Hungarian statistical data [9].

Among these older primiparous women, pregnancy following the use of assisted reproduction techniques does not involve a higher risk of neonatal or pregnancy complications as compared with naturally conceived pregnancies.

6. Conclusions

The high prevalence of reliable method usage in Hungary is not refleced by the high abortion rate. The likelihood of abortion is high among those who do not apply any methods. Our results suggests that less reliable methods (such as barrier and calendar methods or withdrawal), which are very common amongst seekers of abortion, are not properly used. And the third major possibility leading to abortion is the misuse of OCs due to patient failure. Apart from the three major contraceptive determinants of abortion, our logistic regression model shows that a low economic income, completed childbearing after a certain number of children and age can determine a certain risk for abortion. The abortion rate is higher among those with a low educational level, and single women are more prone to have an abortion. Financial dependence through the choice of contraception determines the occurrence of abortion. Iinformation furnished by health-care providers and the media on the correct use of contraceptives is relevant in the prevention of abortion, because it helps the correct use of different contraceptives.

The teenagers requesting abortion do not use any methods or they use a less reliable method (principally the condoms) not always appropriately. They have less information about the fertile period of the menstrual cycle and therefore the chance of abortion is higher. Financial dependence is a modulator of the choice of contraception among teenagers as well as among women in the older age groups. The EC pill, as an alternative after unprotected intercourse, is not known in a reassuringly necessary rate by teenagers. The information gained concerning contraception (directly from their surroundings, i.e. the family and media) is of very low efficacy.

The repetition of unwanted pregnancy is also associated with a low level of education, a higher number of children and age. In contrast, the awareness of all reliable methods and a knowledge of the fertile period of the cycle are not advantageous for repeat aborters.

Pregnancy in the last decade of the reproductive age is becoming more and more common due to the ARTs. There is no relevant difference in pregnancy or perinatal and neonatal outcome between pregnancies of older and younger women, while the rate of Caesarean section is higher among older women, as a result of the accumulation of small differences in the pattern of risk factors in the two groups. ARTs do not represent an evident risk concerning pregnancy and perinatal complication among primiparas aged over 35.

7. References

1. Fathalla MF. Reproductive health in the world: two decades of progress and the challenge ahead. In: Khanna J, Van Look PFA, Griffin PD, eds. Reproductive health: a key to a brighter future. Geneva, World Health Organization, 1992:3-31.
2. Tietze C, Henshaw SK. Induced abortion. A world review. 6th ed. New York, Alan Guttmacher Institute, 1986.
3. Oddens BJ, Visser AP, Vemer HM, Eveaerd WTAM. Determinants of contraceptive use (National population-based studies in various West European countries) Brussels-Delft, Eburon: 1996.
4. Kamarás F.: Fertility and family surveys in countries of the ECE region (Standard country report). New York, Geneva: United Nations, 1999.
5. Szabó János: A prenatális genetikai diagnosztika lehetőségei. Magyar Nőorvosok Lapja, 2000; 63, 3-13. (in Hungarian)
6. Klapp C: Pregnancy in young girls. Zentralbl. Gynakol., 2003; 125:209-217.
7. Ali MM, Cleland J, Shah IH. Trends in reproductive behavior among young single women in Colombia and Peru: 1985-1999. Demography, 2003; 40: 659-673.
8. Demographic Year Book. New York: United Nations, 1998.
9. Hungarian Demographic Year Book. Budapest: Hungarian Central Statistical Office, 2003. (in Hungarian).
10. Burkman RT. Compliance and other issues in contraception. Int. J. Fertil. Wom. Med., 1999; 44: 234-240.
11. Henshaw SK. Induced abortion: a world review, 1990. Fam. Plann. Perspect., 1990; 22: 76-89.
12. Piccinino LJ, Mosher WD: Trends in contraceptive use in the United States: 1982-1995. Fam. Plann. Perspect., 1998; 30:4-10, 46.
13. Rowlands S, Hannaford P. The incidence of sterilisation in the UK. BJOG. 2003; 110: 819-824.
14. Pollack A; ACOG Committee on Practice Bulletins-Gynecology: ACOG practice bulletin. Clinical management guidelines for obstetrician-gynecologists. Number 46, September 2004. (Replaces technical bulletin number 222, April 1996). Obstet. Gynecol., 2003; 102: 647-658.
15. McAnarney ER. Adolescent pregnancy and childbearing: new data. New. Chall. Ped., 1983; 75: 973-975.

16. Rajasekar D, Bigrigg A, Docherty G. Analysis of pill knowledge amongst oral contraceptive users in Scotland according to client characteristics. Eur. J. Contr. Repr. Health Care, 1999; 4: 119-27.
17. Aldous MB, Edmonson MB: Maternal age at first childbirth and risk of low birth weight and preterm delivery in Washington State. JAMA, 1993; 270: 2574-2577.
18. Dienes J, H. Lukács V, Vadász F, Bede E. Experiences of genetic counselling concerning advanced maternal age. Magyar Nőorvosok Lapja, 2000; 63, 293-298. (in Hungarian)
19. Li TC, Macleod I, Singhal V, Duncan SL: The obstetrics and neonatal outcome of pregnancy in women with previous history of infertility. Br. J. Obstet. Gynecol., 1991; 98 1087-1092.
20. Eastman NJ. Prematurity from the viewpoint of the obstetrician. Am. Pract., 1947; 1: 343.
21. Barkan SE, Bracken MB: Delayed childbearing: no evidence for increased risk of low birth weight and preterm delivery. Am. J. Epidemiol., 1987; 125: 101-109.
22. Holloway S, Brock DJH: Changes in maternal age distribution and their possible impact on the demand for prenatal diagnostic services. Br. Med. J., 1988; 296: 978-981.
23. Berkowitz GS, Skovron ML, Lapinski RH, Berkowitz RL: Delayed childbearing and the outcome of pregnancy. N. Eng. J. Med., 1990; 322: 659-664.
24. Stein ZA: A woman's age: childbearing and child rearing. Am. J. Epidemiol., 1985; 121: 327-342.
25. Tuck SM, Yudkin PL, Turnbull AC: Pregnancy outcome in elderly primigravida with and without a history of infertility. Br. J. Obstet. Gynaecol., 1988; 95: 230-237.
26. Gilbert WM, Nesbitt TS, Danielsen B: Childbearing beyond age 40: pregnancy outcome in 24,032 cases. Obstet. Gynecol., 1999; 93: 9-14.
27. Spellacy WN, Miller SJ, Winegar A: Pregnancy after 40 years of age. Obstet. Gynecol., 1986; 68: 452-454.
28. Morrison I: The elderly primigravida. Am. J. Obstet. Gynecol., 1975; 121: 465-470.
29. Kirz DS, Dorchester W, Freeman RK: Advanced maternal age: The mature gravida. Am. J. Obstet. Gynecol., 1985; 152: 7-12.
30. Bianco A, Stone J, Lynch L, Lapinski R, Berkowitz G, Berkowitz RL: Pregnancy outcome at 40 and older. Obstet. Gynecol., 1996; 87: 917-922.
31. Peipert JF, Bracken MB: Maternal age: An independent risk factor for cesarean delivery. Obstet. Gynecol., 1993; 81: 200-205.
32. Tokuhata GK, Digon E, Mann L: Prenatal care and obstetric abnormalities. J. Chronic. Dis., 1973; 26: 163.

33. Ryan GM, Sweeney PJ, Solola AS: Prenatal care and pregnancy outcome. Am. J. Obstet. Gynecol., 1980; 137: 876-81.

34. Moore TR, Origel W, Key TC, Resnik R. The perinatal and economic impact of prenatal care in low-socioeconomic population. Am. J. Obstet. Gynecol., 1986; 154: 29-33.

35. Kramer MS: Intrauterine growth and gestational duration determinants. Pediatrics., 1987; 80: 502-511.

36. Al-Eissa YA, Ba'Aqeel HS. Risk factors for spontaneous preterm birth in a Saudi population. Eur. J. Obstet. Gynecol. Reprod. Biol., 1994; 57: 19-24.

37. Hosmer DW, Lemeshow S. Applied logistic regression. New York, MD: John Wiley and Sons, 1989.

38. Joubert K. Hungarian birth weight and birth longevity standards from 1990 to 1996 according to the Hungarian figures concerning live births. Magyar Nőorvosok Lapja, 2000; 63, 155-163. (in Hungarian)

39. Van Bogaert LJ. 'Failed' contraception in a rural South African population. S. Afr. Med. J., 2003; 93:858-861.

40. Guillebaud J. Contraception, your questions answered, 2nd edn. New York, MD: Churchill Livingstone, 1993.

41. Wong MT, Singh K. The combined oral contraceptive pill in women over age forty. Ann. Acad. Med. Singapore., 2003; 32: 624-631.

42. Thang NM, Huong VT: Changes in contraceptive use in Vietnam. J. Biosoc. Sci., 2003; 35: 527-543.

43. Barden-O'FallonJ, Tsui A, Adewuy A: Social and proximate determinants of sexual activity in rural Nigeria. J. Biosoc. Sci., 2003; 35: 585-599.

44. Ngom P, Magadi MA, Owour T: Parental presence and adolescent reproductive health among the Nairobi urban poor. J. Adolesc. Health., 2003; 33: 369-377.

45. Wilcox AJ, Weinberg CR, Baird DD. Timing of sexual intercourse in relation to ovulation. Effects on the probability of conception, survival of the pregnancy, and sex of the baby. N. Engl. J. Med., 1995; 333(23): 1517-21.

46. Boyle FM, Dunne MP, Purdie DM, Najman JM, Cook MD: Early patterns of sexual activity: age cohort differences in Australia. Int. J. STD AIDS., 2003; 14:745-752.

47. Hewitt G, Cromer B. Update on adolescent contraception. Obstet. Gynecol. Clin. North. Am., 2000; 27: 143-162.

48. Blythe MJ, Rosenthal SL. Female adolescent sexuality. Promoting healthy sexual development. Obstet. Gynecol. Clin. North. Am., 2000; 27: 125-141.

49. Renteria SC, Narring F. Adolescent sexuality: epidemiology, clinical approach and preventive measures. Schweiz. Rundsch. Med. Prax., 2000; 89: 5-16.

50. Santow G, Bracher M. Explaining trends in teenage childbearing in Sweden. Stud. Fam. Plann., 1999; 30: 169-182.

51. Torres MI: Cultural dynamics in sexual and reproductive health. Reflection on prevention programs in Latino communities in the United States. P. R. Health. Sci. J., 2003; 22:299-304.

52. Anderson JE, Santelli J, Gilbert BC. Adolescent dual use of condoms and hormonal contraception: trends and correlates 1991-2001. Sex. Transm. Dis., 2003; 30:719-722.

53. Kershaw TS, NiccolaiLM, Ickovics JR, Lewis JB, Meade CS, Ethier KA. Short and long-term impact of adolescent pregnancy on postpartum contraceptive use: implications for preventation of repeat pregnancy. J. Adolesc. Health., 2003; 33: 359-368.

54. Riphagen FE, Ketting E. Comparative overview of results from eight surveys on contraceptive behaviour. In: Ketting E, ed. Contraception in Western Europe; a recurrent appraisal. Carnforth: Parthenon Publishing Group, 1990: 77-110.

55. Edge V, Laros RK. Pregnancy outcome in nulliparous women aged 35 or older. Am. J. Obstet. Gynecol., 1993;168: 1881-1885.

56. Prysak M, Lorenz RP, Kisly A: Pregnancy outcome in nulliparous women 35 years and older. Obstet. Gynecol., 1995; 85: 65-70.

8. Acknowledgements

I am deeply indebted to Professor László Kovács M.D., D.Sc. Director of the Reproductive Health Ph.D. Programme.

I wish to express my grateful thanks to my Ph.D. supervisor, Professor György Bártfai M.D. D.Sc. for his continuous support, encouragement and help. His professional guidance has greatly enhanced my scientific work, and his advice over the past years has been invaluable.

I am especially obliged to Professor Attila Pál M.D., Ph.D., Director of the Department of Obstetrics and Gynaecology, for allowing and fully supporting my scientific activity.

I am extremely grateful to Krisztina Boda Ph.D. for excellent technical assistance in the statistical analysis and for helpful discussions.

I would like to express my gratitude to Hajnalka Orvos M.D., Ph.D. (Department of Obstetrics and Gynaecology) and Márta Katona M.D., Ph.D. (Department of Paediatrics) for their encouragement and their tremendous merits in helping my project.

I wish to express my thanks to Mrs. Csepi Gizella Szűcs (Family Planning Service in Csongrád County) for her direct and enthusiastic participation in my experiments.

I am especially grateful to my family for their patience and support.